



## CASE REPORT

# Surgical excision of post-burn heterotopic ossification of the popliteal space

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## Introduction

Heterotopic ossification (HO) may arise following trauma,<sup>20,22</sup> total hip arthroplasty,<sup>2,5,18</sup> spinal cord injury<sup>8,10,21</sup> and brain insult.<sup>4,14</sup> HO formation following burns is rare, with very few cases reported.<sup>6,17</sup> Periarticular HO affects the knee less often than the shoulder, elbow and hip joints, even in patients with traumatic brain injury where the incidence of heterotopic ossification varies from 11–76%.<sup>9,16</sup> HO of the posterior knee is rare<sup>1,3,16</sup> and for this to require surgical excision is exceptional.<sup>1</sup> There are only three reports evaluating the results of surgical excision of HO around the knee,<sup>1,3,16</sup> all following traumatic brain injury.

## Case report

A 30-year-old lady was referred to our institute for the management of periarticular bony ankylosis of the right knee. The patient was informed that data concerning the case would be submitted for publication. She did not have any history of local trauma, head injury or spinal cord injury. She had

sustained third degree thermal burns to both calves 2 years previously. In the first week after sustaining the burns, she developed spontaneous onset of pain, swelling and limitation of movement in the right knee. Radiographs of the knee did not show any abnormality. Doppler ultrasonography was performed to rule out deep vein thrombosis and was normal. The patient was given NSAIDs and an above knee plaster slab for pain relief. After removal of the plaster slab 3 weeks later, the swelling had decreased but there was significant loss of knee mobility. She was given active and passive range of motion exercises but no investigation was undertaken. She continued to lose movement in the knee joint until the knee became fixed.

The patient presented to our hospital 24 months after burns with ankylosis of the right knee in slight flexion. She had no pain but walked with a stiff knee gait. As Indian lifestyle requires squatting and sitting cross-legged for toileting and other household activities, her activities of daily living (ADL) were significantly limited. Systemic examination was normal. Local examination of the right knee revealed a bony hard, non-tender mass in the popliteal fossa that was fixed to the underlying bones. The popliteal pulse was displaced laterally; there was no distal neurovascular deficit. The knee was fixed in 5° flexion. There were scar marks of the burns over both calf regions, 5 cm × 7 cm on the right and

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**Figure 1** Scar marks of burns on bilateral calf regions.

10 cm × 12 cm on left (Fig. 1). Routine haematology and biochemistry, including ESR and alkaline phosphatase level, were within normal limits. Anteroposterior and lateral radiographs of the right knee showed a heterotopic ossification mass bridging the lower femur and upper tibia posteriorly (Fig. 2). MRI of the knee showed a mature bony mass involving the medial head of gastrocnemius and soleus displacing the popliteal and posterior tibial vessels posteriorly and laterally. MR angiography revealed popliteal vessels of normal calibre without any extrinsic compression (Fig. 3).

At operation the mass was approached posteriorly through a lazy S incision. The popliteal vessels were found to be displaced laterally and were free from the mass except near the distal margin where there was an attempt to engulf the vessels and the vessels were lying in a groove within the HO mass. Multiple

small feeding vessels were encountered and ligated. The mass was excised piecemeal and 140° of flexion was achieved on the operating table. The wound was closed over a suction drain that was removed on the second post-operative day and the patient was given oral indomethacin (25 mg t.i.d.) for 6 weeks. In addition, she received 20 Gy of local radiotherapy in 10 divided fractions daily starting on the third post-operative day. Continuous passive motion was started from the second post-operative day and the patient was encouraged to do active and resisted muscle strengthening exercises. She was able to flex the knee up to 90° by the end of the second week, which improved to 120° at the last follow-up (23 months post-operatively). She can now squat, sit cross-legged and perform her daily activities and household work with near normal function. There were no wound related complications and there is no evidence of recurrence of the heterotopic mass (Fig. 4).

## Discussion

Heterotopic ossification is a well-recognised complication following brain injury, spinal cord injuries, local trauma and hip or knee arthroplasty. However, HO only rarely occurs following burns.<sup>6,17</sup> In a study of 950 patients with burns, Evans and Smith<sup>6</sup> found only four patients who had peri-articular ossification, none of them involved the knee. Involvement of the knee is uncommon even in patients with HO following traumatic brain injury in whom a high incidence of HO has been reported varying from 11–76%<sup>23</sup> and it rarely requires excision.<sup>8,12,13</sup>



**Figure 2** Radiographs of the right knee, (A) anteroposterior and (B) lateral view, showing paraarticular heterotopic ossification mass located posteriorly and bridging the knee joint.



**Figure 3** (A) An axial magnetic resonance image of the right knee showing the mature heterotopic mass located in popliteal fossa, popliteal vessels are displaced posteriorly and laterally. (B) Magnetic resonance angiogram showing normal caliber of the vessels with no extrinsic compression.

Garland<sup>11</sup> reported three cases of HO around knee in a series of 496 patients following traumatic brain injury. One of the patients had the HO located posteriorly, but did not require excision as there was no bony ankylosis. Only two case series have dealt with the results of resection of HO around the knee.<sup>3,16</sup> Charnley et al.<sup>3</sup> and Ippolito et al.<sup>16</sup> reported surgical excision of HO around knee following brain injury in a series of five patients each, none of them occurred posteriorly. The only other case report of HO in the popliteal fossa requiring surgical excision is by Anderson and Lais<sup>1</sup> in a patient with traumatic brain injury. HO mass occurring after burns, involving the knee posteriorly and requiring surgical excision has not been reported previously.

Exact pathogenesis of HO following burns is not well understood but circulatory stasis, tissue hypoxaemia and immobility have been hypothesised to play a role.<sup>6,17</sup> The proximity of the involved joint to the area of the burn is not a pre-requisite and the HO may develop around a joint far from the site of the burn.<sup>6,17</sup> In the present case, the patient developed HO on the right side although the burnt area was larger on the left side (Fig. 1). We agree with the explanation offered by Evans and Smith<sup>6</sup> that in a

patient with burns, due to immobility there is a continuous release of bone salts which along with the humoral and physiological alterations that follow the acute burn affect all soft tissue structures alike regardless of the proximity to the burnt area.

Diagnosis of HO may be difficult during the acute stage and may be confused with deep vein thrombosis especially in the lower limbs.<sup>19</sup> Tc-99m biphosphonate bone scanning may be helpful in establishing the early diagnosis in doubtful cases.

Surgical excision of the HO is frequently complicated by a high rate of recurrence.<sup>9</sup> The literature of HO in patients who have had a spinal cord injury<sup>7,15,23</sup> emphasises that the presence of maturity of the lesion based on the radiographic appearance, a normal level of alkaline phosphatase, and serial bone scans that demonstrate no or decreased activity will minimise the chances of recurrence of a lesion after it is resected and 18 months is a period generally accepted as the time required for maturation. In contrast, in patients with HO following brain injury, Garland et al.<sup>9</sup> showed that the chances of recurrence after surgical resection of HO did not correlate with the serum level of alkaline phosphatase or the results of bone scan. They, however,



**Figure 4** Follow-up radiographs at 23 months post-operatively: (A) and (B) anteroposterior and lateral views, (C) lateral view in flexion. The remnants of the HO mass did not enlarge during follow-up.

believed that mature bone is less likely to recur after resection and at least 18 months should have elapsed after the head injury before excision. Ippolito et al.<sup>16</sup> also found no difference in terms of the quality of results and the rate of recurrence between the knees that had been operated before 18 months from the time of injury and the knees that had been operated after 18 months. In our case the resection was performed 24 months following the initial event and the serum alkaline phosphatase level was normal at the time of surgery. We did not perform a bone scan to assess the maturity.

The post-operative protocol following resection of the HO to prevent recurrence is controversial.

Charnley et al.<sup>3</sup> used indomethacin as prophylaxis against recurrence and concluded that it had a protective effect. According to Ippolito et al.<sup>16</sup> continuous passive motion (CPM) or indomethacin or both modalities are useful in preventing the recurrence of HO, although the long-term functional result of the surgical excision of HO is strictly related to the degree of patient's neurological recovery. Anderson and Lais<sup>1</sup> used single dose of radiation (800 Gy) along with CPM as adjunctive modalities. All of these three papers relate to patients with HO following brain injury where neurological recovery is important in the ultimate functional outcome of surgery and hence are different

from our patient who was otherwise normal. In view of the relatively sparse data available in the literature on the results of resection of HO around knee following burns, we employed oral indomethacin as well as local radiotherapy in addition to CPM as measures to prevent recurrence in the post-operative period.

This case presents a unique complication of burns leading to the formation of HO in the popliteal fossa, causing an extra-articular ankylosis and requiring surgical excision, which has not been reported previously. Surgical excision of the mass followed by prophylactic radiotherapy, oral indomethacin and CPM led to an excellent recovery and the patient returned to near normal activity level without recurrence of heterotopic ossification.

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